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WHY CERTAIN KINDS OF TIMBER PREVAIL IN CERTAIN LOCALITIES.

BY JOHN T. CAMPBELL.

IT has often been observed that in certain localities a certain species of timber will prevail, or be more numerous than any, and sometimes than every other kind. It has been further observed that when any prevailing timber has been cleared away, and the land allowed to grow up again in timber, that some other species will prevail. This, I think, has often been erroneously attributed to the inability or indisposition of the soil to reproduce the former prevailing timber. I have observed much on this subject, and I never could see any important difference in the ability or disposition of the soil to nourish any of the different kinds of native trees, and also no important difference in the success in planting and starting them.

My observations convince me that it all, or mainly, lies in the favorable condition of the ground to receive the seeds of the various species of timber when it happens to fall thereon. A sycamore in the Wabash region will grow as large and rapidly on the uplands, where they are seldom found, as in the sandy bottoms along the margins of the streams, where they seem to best thrive. A white oak when planted will grow as well in the low river bottoms, where they are never or seldom found, as on the hills and ridges near by, where they seem to be the spontaneous product of the ground.

But if an acorn should be blown from a white oak on the hills into the low bottoms beneath, it would fall on ground very unfavorable to the sprouting of such acorns, and it would rot where it fell. So, on the other hand, if a sycamore ball (which contains one thousand to two thousand seeds) should, in the spring time, be blown to pieces after the winter's freeze, and their needle-like seeds be blown upon the adjacent hills, very few of them would light on ground favorable to sprouting them. Occasionally we find a lone sycamore on the uplands, standing among the oak, beech, poplar and other upland timber, and every year bearing its quota of seed and shedding them on the adjacent ground by the million, none, or very few of which, ever take effect, and for reasons before hinted at, but which will be more fully explained further on.

The sycamore seed must fall on ground, warm, very moist, but not absolutely wet, and sufficiently bare for the sun to shine on it the greater part of the day. Otherwise it may not sprout. The acorn, on the other hand, falls a little while before the leaves fall. If it falls on very moist ground it rots. If it falls on the leaves of the former year, and is shaded enough to prevent drying or baking from the sun, and is covered lightly by the fall of the current year's leaves, or by a chance wind has the old leaves drifted on top of it, a slow rain with subsequent sunshine will sprout it. It will send out little rootlets which bore through the underlying old leaves and penetrate the ground, and once started, no weather or climatic conditions will kill it. The same is true of the seed of the hickory, beech, sugar maple and other upland trees.

During the past two years my work has been on and about the Wabash river banks and its bottoms (flood-plains), and I have discovered why it is that in some parts of these bottoms one kind of timber, as sycamore, will take complete possession of a few acres, while at or near by the cottonwood will prevail almost to the exclusion of everything else, and at other places the soft or water maple will do likewise, and at still another the water elm will monopolize all the space on which a grown tree can stand for several acres.

It comes about in this way. The balls of the sycamore, after undergoing the winter's freeze, are dissolved so that the separate, needle-like, or more properly pin-like seeds (as the outer end has the germ of the root, and swells into a bulb like a pin-head) are blown by the wind, the little "fuz" they hold enabling them to float a great way both in wind and on water. They begin falling early in the spring months, and if a flood is receding at the time, they stick to the soft, moist banks wherever they touch them, and particularly along the highest part of the sand bars. Were it not for the subsequent floods the same spring, there could no other trees grow, as the sycamore, being the first to shed, would seed all the tree-growing space (each large tree bearing one hundred and fifty million seeds), and their broad leaves would shade the ground till nothing else could sprout. But during their early infancy they are easily killed by an overflow, and this ill fortune happens to the greater portion of them.

The cottonwood is the next in order of shedding seed. If another flood is receding while the cottonwood is shedding, this flood will have killed all the sycamores which it covered for only a few days, and will sprout all the cottonwood seed that may fall on and along the banks and bars. As the earlier floods are generally the highest there will be some sycamores not reached by the following floods, and they will hold sway along that margin. If, when the cottonwoods are a few inches high, another flood follows, they too will be killed to the extent that they are kept under water a few days.

Next to the cottonwood the soft, or bottom maple sheds its seed. If a flood is receding this seed will occupy all the space, as, having a smaller leaf than the sycamore or cottonwood, they will grow closer together. They in turn may be killed by a flood when they are very young.

I have forgotten the exact time that each of these trees sheds its seed, something will of course depend on the forwardness of the spring. But along the Wabash banks, last spring, I could see three belts of young trees, and distinguish them by their general appearance. The farther off, the plainer these belts show, till lost to view. The upper belt was sycamore, the second (downward) cottonwood, and the third soft maple. In June following there came a bigger flood than any that caused the seeds to sprout, and killed all of them. There was a much bigger flood in the preceding February, but no seed fell then.

It will sometimes happen that the flood that plants the sycamores will be the last one for that year, and when they have lived through one summer they are safe from any danger from overflow. In still other seasons it will happen to favor the cottonwood, or the maple, or elm, or willow. New bars are all the time extending from the lower ends of the old ones, and as the elevation of these will be such as to be sometimes flooded once and not again for that year, the trees that shed their seed with the flood that barely covers such bars will plant them to overflowing fullness of their kind, and once they are secure from other floods they live out their time of two hundred to three hundred years.

The upper surface of the interior of the bottoms (back from the rivers) is built up by sedimentation, and when built above the height of the average floods, the burr oak, black walnut, buckeye, pawpaw and bottom hickory make their appearance. Such sycamores, cottonwoods and maples as live long enough to be relegated to the interior (as very few of them do) by the bottoms building riverward away from them, do not and cannot reproduce themselves, as the conditions that sprout their seeds have moved away from them. They die at the end of three hundred years at most, and leave no heirs to the soil.

How do the occasional lone, stray sycamore and cottonwood find their way to the uplands? I can see how in one case it was not only possible but very probable. Five miles south-east of where I am now writing (Rockville, Indiana) is a pasture of hill land, so fenced as to include a section of a small stream at the foot of a hill facing north. There stand several half-grown sycamores which bear and shed their seed in this corner watering place. There these seeds are sprouted. There the cattle and horses resort for water. Every thimbleful of mud that may stick to their hoofs is liable to contain from one to five half-sprouted seeds, which are carried up the hillside and on the upland, as the cattle and horses return to their grass, and dropped where the sun takes up the unfinished work of growing the tree. The result is, that on every square rod of ground near this watering place stands one to five sycamores, varying in age from one to ten years, and they diminish in number as the distance from the watering place increases. It has been used as a pasture about ten years. I remember when it contained no sycamore at all. Just outside of the pasture fence, to the eastward, the land has never been fenced. The cows may drink where they please, and there are no sycamores scattered over the adjacent hills. If any seeds are thus carried there, the forest leaves and shade prevent their sprouting and growing. But along the little sand and gravel bars of the stream, they sprout as thick as grass, only to be killed by the floods from the early summer showers.

From this I infer that two hundred to three hundred years ago the deer, elk and buffalo in their many wanderings across streams and over hills, have occasionally carried in their hoofs partly sprouted seeds, and dropped them on the hills where the sunshine was unobstructed, and the trees thus got their footing, and once getting it were able to stand afterward. These are the only kinds of trees I have observed, but I presume a similar law governs the distribution and self-planting of them all.

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ON THE EVOLUTION OF THE VERTEBRATA, PROGRESSIVE AND RETROGRESSIVE.

BY E. D. COPE.

(Continued from page 247, March number.)

THE REPTILIAN LINE—CONTINUED.

IN the first place, this line departs with lapse of time from the primitive and ancestral order, the Theromorpha, in two respects. First in the loss of the capitular articulation of the ribs, and second in the gradual elongation and final freedom of the suspensory bone of the lower jaw (the os quadratum). In so departing from the Theromorpha, it also departs from the mammalian type. The ribs assume the less perfect kind of attachment which the mammals only exhibit in some of the whales, and the articulation of the lower jaw loses in strength, while it gains in extensibility, as is seen in the development of the line of the eels among fishes. The end of this series, the snakes, must therefore be said to be the result of a process of creation by degeneration, and their lack of scapular arch and fore limb and usual lack of pelvic arch and hind limb are confirmatory evidence of the truth of this view of the case.

Secondly, as regards the ossification of the anterior part of the brain-case. This is deficient in some of the Theromorpa, the ancestral order, which resemble in this, as in many other things, the cotemporary Batrachia. Some of them, however (Diadectidæ), have the brain completely enclosed in front. The late orders mostly have the anterior walls membranous, but in the streptostylicate series at the end, the skull becomes entirely closed in front. In this respect then the snakes may be said to be the highest or most perfect order.

As regards the scapular arch, no order possesses as many ele-